

## REMARKS

The present invention involves making **metastable complexes** of minerals and amino acids that are highly soluble in an aqueous medium. As described at page 4, lines 23-30 of the application, the main characteristic of the complexes formed according to this invention is that they are metastable (i.e. a mixture of various combinations of mineral, amino acid, and organic acid that has not yet reached a final stable equilibrium with the surrounding medium). These metastable complexes have a relatively high degree of solubility in aqueous medium, and are capable of remaining in solution for at least about 24 hours at about 25° C without forming a significant amount of precipitate. The cited prior art does not show the formation of metastable complexes from a combination of minerals, amino acids, and organic acids.

There are also at least three crucial aspects to the methods claimed in claims 1-9 (and the products created using said method, as in claims 10-12): (1) the ratio of amino acid to mineral; (2) the ratio of organic acid to amino acid and mineral; and (3) rapid dehydration. The cited references do not suggest a method with these three aspects, and therefore do not anticipate or make obvious claims 1-12.

U.S. Patent No. 4,830,716 to Ashmead ("*Ashmead '716*") describes a **stable chelate**, substantially free of anions, made by reacting an amino acid with a metal compound. It does not describe a **metastable mineral complex**. *Ashmead '716* also requires an amino acid ligand to metal ratio of 2:1 or more, preferably between 2:1 and 4:1. (*Ashmead* col. 4 lines 59-65). Claims 1-12 require that the amino acid to mineral ratio be less than 2:1, a range not disclosed by *Ashmead '716*. The claimed invention utilizes less amino acid for a given amount of mineral, allowing for the delivery of a greater concentration of minerals. *Ashmead* also fails to disclose the claimed ratio of organic acid to mineral (about 0.1:1 to about 0.7:1), and

preferably omits organic acid altogether, relying solely on the amino acids to drive the chelating reaction. (*Ashmead* Col. 3 lines 17-25).

U.S. Patent No. 6,992,203 to Trusovs ("*Trusovs* '203") is cited by the Examiner as showing that the prior art describes using an organic acid to form metal chelates, reacting metal and organic acid in a ratio of 1 mole metal to 1-3 moles organic acid. The range of organic acid claimed in the present application falls well below the level described as prior art by *Trusovs* '203--claims 1-12 of the present application require a ratio of mineral to organic acid of about 1:0.01 to about 1:0.7. Therefore, *Trusovs* neither anticipates claims 1-12 nor makes them obvious when combined with *Ashmead* '716. In addition, *Trusovs* does not disclose or suggest formation of **metastable** complexes, and in fact is concerned with increasing the stability of metal chelates.

U.S. Patent No. 5,186,965 to Fox ("*Fox* '965") is cited for techniques of drying a metastable material. As the Examiner recognizes, *Fox* '965 does not disclose use of an amino acid in the formation of a metastable mineral product, and therefore does not describe the same type of metastable complex formed according to the present invention. *Fox* '965 also fails to suggest that any of the drying techniques disclosed therein should be used with the process of *Ashmead* '716, since Fox does not describe the combining of amino acids and minerals to form a chelate.

The claimed ratios of reactants in claims 1-12 were chosen to create improved **metastable** mineral complexes that are **highly soluble** in water and which **do not deteriorate flavor** when added to food products in high concentration. Those claims require combining amino acids, organic acids, and minerals in specific ratios followed by rapid drying. None of the cited references (alone or in combination) suggest the particular claimed ratios of reactants, and none of the

references (alone or in combination) suggest that rapid drying is essential or that it will have an effect on the functionality of the derived product. Furthermore, none of the cited references are concerned with the impact of the mineral composition on the flavor of food products, and therefore there is no indication that the disclosed ranges of reactants shown by the prior art may even be substituted for the claimed ranges.

Claims 8 and 9 further require that the solution formed by combining the amino acid(s), mineral(s), and organic acid(s) have a pH between about 2.0 and about 7.0. The reference cited by the Examiner, *Ashmead* '716, shows the formation of an alkaline solution (pH of about 8.0), and therefore claims 8 and 9 do not read on *Ashmead* for this additional reason.

Since the ratios of reactants in claims 1-9 are not obvious, claims 10-12 (which claim products derived by combining those claimed ratios of reactants) are also not obvious.

Claims 13-20 are also non-obvious in light of the cited references. Claims 13-20 require a mono-, di-, or trivalent cationic mineral in a **metastable** complex, whereas *Ashmead* '716 shows a cationic mineral in a stable chelate. Claim 13 also requires a mole ratio of mineral to amino acid of about 1:0.5 to less than 1:2. As shown above, this ratio is not shown by *Ashmead* '716 (or either of the other cited references).

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